

RESEARCH ARTICLE

Development and Application of Teaching-Learning Materials with a Generative AI for 'Exploration and Design of Career and Job' Lesson at Vocational High Schools

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ABSTRACT

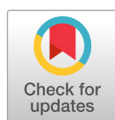
This study aims to introduce Generative AI into vocational subject classes by developing teaching-learning materials that satisfy the achievement standards of 'Exploration and Design of Career and Job' learning element in 'Successful Career Life' subject, which is a specialized common subject presented in 2022 Revised National Curriculum for vocational high schools. The ADDIE model was applied to develop the materials.

In the analysis phase, a literature review was conducted to identify the instructional needs for utilizing Generative AI in the 'Successful Career Life' subject of vocational high schools. Based on these findings, instructional goals were derived, and relevant tasks were analyzed to fulfill the achievement standards of the 'Exploration and Design of Career and Job' learning element.

In the design phase, specific learning objectives were formulated, and evaluation plans for academic achievement were established. To enhance learner motivation, instructional strategies based on the ARCS model were constructed. ChatGPT, Gamma, and Canva were selected as teaching-learning tools.

In the development phase, a total of six instructional materials, including a lesson plan for the 'Exploration and Design of Career and Job' learning element, were developed. The validity of these materials for field application was verified by experts, followed by a pilot test. Ultimately, materials for seven class sessions were completed. Afterwards, a pilot test was conducted and teaching-learning materials for a total of 7 classes were completed. In the implementation phase, the developed teaching-learning materials were applied in a class for 16 students at J Meister High School in Jeonbuk province. In the evaluation phase, the degree of learners' achievement regarding the 'Exploration and Design of Career and Job' standards was assessed using a developed rubric, and learner satisfaction was surveyed. The average score for learners' achievement based on the rubric was 14 out of 15. Through the above efforts, it is expected to provide opportunities to use new AI tools such as Generative AI in vocational high school classes, and also to expand the scope of related literacy cultivation and vocational education.

Keywords: Generative AI, successful career life, exploration and design of career and job, chatgpt, gamma, canva



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Introduction

Background and Purpose of the Study

The release of ChatGPT sparked significant interest in the educational field regarding Generative AI and its educational applications (Lee & Song, 2023). In response, the Ministry of Education (2022a, 2022c, 2023b) emphasized the necessity of education in response to the digital transformation driven by AI technological advancements and the emergence of Generative AI technologies like ChatGPT, as reflected in the 2022 Revised National Curriculum. According to prior studies (Choi, 2023; Lee, 2023; Park, 2023), vocational high school teachers also recognize the importance of AI education and have expressed the need to reform teaching methods toward self-directed learning utilizing Generative AI. However, a review of existing research on educational programs utilizing Generative AI and their effectiveness (Choi, 2023; Ho, 2024; Kim, 2024) reveals that most implementations have been limited to general subjects, with few cases or studies focusing on specialized vocational subjects.

Therefore, in order to effectively introduce Generative AI into specialized vocational subjects, it is necessary to select subjects that are commonly included across all vocational high school curricula, rather than those limited to specific tracks. In particular, it is advisable to develop teaching-learning materials that integrate Generative AI into “Successful Career Life,” which is not only broadly applicable in vocational high schools but also the only vocational subject reflected in university entrance examinations following the 2028 college admission reform (Ministry of Education, 2023a). Considering the reported advantages of Generative AI such as its effectiveness in saving time when searching for desired answers and assisting in structuring writing and using new expressions (Ahn, 2024; Song, 2023), As a result of reviewing the achievement standards for each learning element of “Successful Career Life” in the 2022 Revised National Curriculum, it is noteworthy that the “Exploration and Design of Career and Job” learning element recommends using digital resources for tasks such as preparing career design documents and presentation materials (Ministry of Education, 2022b). This makes it naturally compatible with the integration of Generative AI and provides potential for synergy.

Accordingly, the purpose of this study is to develop teaching-learning materials that utilize Generative AI in the “Exploration and Design of Career and Job” learning element of the “Successful Career Life” subject in vocational high schools, thereby introducing Generative AI into vocational education.

Research Content

To achieve the purpose of this study, the following specific research contents are established:

First, through literature review and practical class operation, this study analyzes the necessity and demand for developing teaching-learning materials aimed at achieving the achievement standards of the “Exploration and Design of Career and Job” learning element in the “Successful Career Life” subject at vocational high schools, and explores ways to utilize Generative AI.

Second, based on the above analysis, the study defines learning objectives for the “Exploration and Design of Career and Job” learning element and establishes assessment plans and strategies to determine the level of achievement. It also

designs instructional strategies, methods, and media utilizing Generative AI.

Third, the study develops teaching-learning materials for the “Exploration and Design of Career and Job” learning element using Generative AI, verifies their field applicability through expert reviews, conducts a pilot test, and makes necessary revisions and improvements.

Fourth, the study conducts a field test of the developed materials with vocational high school students and uses a scoring rubric to evaluate whether students have achieved the learning element’s objectives.

Theoretical Background

Generative AI

Characteristics of Generative AI

Generative AI refers to artificial intelligence technology that generates content in response to prompts written in natural language (UNESCO, 2023). Therefore, the ability to obtain desired results through prompts has become an essential skill in the AI era (Hwang, 2023). The types of content generated by Generative AI include not only text but also images, voice, and video (Lee & Shim, 2024). Considering the limited instructional time and subject goals, it is important not to attempt to use all available platforms indiscriminately. Rather, instructors should select Generative AI tools appropriate to the instructional objectives and guide learners to use them effectively as learning aids.

Educational Use of Generative AI

Text-based generative AI such as ChatGPT, Wrtn, Copilot, Gemini, Bing, and Gamma are becoming mainstream, and Midjourney and DALL E, which are strong in visualization, and Clova and Suno, which are advantageous in sound and video generation, are being introduced. Currently, ChatGPT is mainly used, but as users and demand characteristics become more diverse, various generative AIs are introduced, and it is expected that it will become an indispensable tool in the education field and social life like various smart devices.

According to prior studies related to the use of Generative AI in vocational high schools (Choi, 2023; Lee, 2023), there is growing interest in AI in vocational education, as well as the need to reform instructional methods toward self-directed learning using technologies like Generative AI. Generative AI tools such as ChatGPT are especially effective in accurately interpreting user questions and intentions in conversational form, providing rapid answers. This significantly reduces the time and effort typically spent navigating search engines (Song, 2023), and also supports learners in organizing writing or generating creative expressions (Ahn, 2024). These advantages are especially meaningful in time-limited classroom settings, where learners can save time spent on online searches and create richer outcomes by incorporating creative expressions they would not normally use. Prior studies on lessons using Generative AI in general high schools (Ho, 2024; Kim, 2024; Kwon, 2023; Lee, 2023) emphasize that:

Generative AI can be used during the development of teaching-learning materials.

Theoretical education on the fundamentals and practical use of Generative AI should precede lesson implementation.

Instruction should include how to write and refine prompts, and how to critically evaluate AI-generated content. The

proper digital infrastructure, including internet connectivity, is crucial for effective implementation.

“Exploration and Design of Career and Job” in “Successful Career Life”

Background for Selecting the Subject “Successful Career Life”

As mentioned in prior studies, research on Generative AI applications in specialized vocational subjects is still limited. Therefore, it is appropriate to conduct research on a subject that can be universally applied across vocational high schools and is effective for integrating Generative AI.

Under the 2022 Revised National Curriculum, the following three “specialized common subjects” are included: “Successful Career Life(carried over from the 2015 curriculum)”, “Labor Rights and Industrial Safety and Health”, “Digital and Career Life”

While the “Digital and Career Life” subject is more suitable in terms of content alignment with AI integration, the Ministry of Education (2023a) has designated only “Successful Career Life” for the Career Exploration section of the 2028 College Scholastic Ability Test. Therefore, “Successful Career Life” is expected to be prioritized in the school curriculum. Consequently, there is a clear need to develop Generative AI-based teaching-learning materials for the “Successful Career Life” subject.

Rationale for Selecting the “Exploration and Design of Career and Job” Learning Element

When using Generative AI educationally, the hallucination phenomenon—where false information is presented convincingly—must be carefully guarded against, making it crucial to verify the accuracy of the information generated. While other types of writing require prior knowledge of the subject and significant time and effort to verify the accuracy of information, students can more easily discern the authenticity of information in writings that narrate their own stories (Ahn, 2024).

A review of the achievement standards and instructional considerations of the “Successful Career Life” subject reveals that the “Exploration and Design of Career and Job” learning element involves setting career and job goals that fit one’s interests and aptitudes and planning for the future. This learning element takes the form of a personal narrative, making it relatively easier to verify information accuracy. It also encourages the use of digital resources and the creation of presentations, making it the most suitable learning element for applying Generative AI in the instructional process (Ministry of Education, 2022b). The achievement standards of ‘Exploration and Design of Career and Job’ are shown in Table 1.

Table 1. Achievement standards for “exploration and design of career and job” and their considerations

Achievement Standards	Students should be able to use various search tools to gather and organize information about careers and occupations, identify successful professionals in their chosen field, analyze the factors behind their success, select a suitable career based on their interests and aptitudes, plan their future concretely, and present it using presentation tools.
Considerations	Guide students to use digital tools and other resources to find and organize career information. Help students identify successful case studies and extract key success factors. Provide career design templates tailored to the students’ learning environment and context.

Source: Ministry of Education (2022b). Mechanical Engineering Curriculum Supplement (2022-33), p. 21.

Research Procedure and Method

Research Procedure

The purpose of this study is to develop teaching-learning materials using Generative AI that help students meet the achievement standards of the “Exploration and Design of Career and Job” learning element in the “Successful Career Life” subject. To achieve this, the ADDIE model was revised and applied as shown in Fig. 1.

Procedure	Content
Analysis	- Needs analysis - Learner analysis - Environmental analysis - Task analysis
Design	- Statement of learning objectives - Establishment of evaluation methods and strategies - Selection and sequencing of learning content, instructional strategies, methods, and media
Development	- Development and expert validation of lesson plans, rubrics, and other teaching-learning materials - Identification and revision of issues through pilot test
Implementation	(Main field test) Conducting lessons using developed materials
Evaluation	- Analyzing the achievement of the “Exploration and Design of Career and Job” standards - Collecting and analyzing learner satisfaction survey results

Fig. 1. Research procedure and content

Research Method

Analysis

The analysis examine the perception of vocational high school specialized subject teachers on Generative AI and the necessity of introducing Generative AI to specialized subject classes based on previous studies. Next, it is analyzed that the achievement standards of ‘Exploration and Design of Career and Job’ learning elements of the ‘Successful Career Life’ subject in the 2022 revised curriculum to conduct a ‘needs analysis’ and analyze the ‘learners and environments’ to which teaching-learning materials will be applied. Afterwards, the instructional goals and their subordinate skills and tasks are identified and analyzed.

Design

Based on the analysis, learning objectives are stated. Then, evaluation methods and strategies are established, the learning content is selected and sequenced, and appropriate instructional strategies and media are chosen.

Development

Based on the achievement standards of the “Exploration and Design of Career and Job” learning element, the lesson plan, teaching-learning materials, and scoring rubric are developed. These materials are validated by experts and revised accordingly. A pilot test is conducted with vocational high school students, and further revisions are made based on the results.

Implementation

The finalized teaching-learning materials are applied to a class of 16 third-year students at J Meister High School in Jeonbuk province. The lesson is conducted under the “Successful Career Life” subject, focusing on the “Exploration and Design of Career and Job” learning element.

Evaluation

After the lesson, students’ learning outcomes are collected, and a satisfaction survey is administered. The learning outcomes are evaluated based on the developed rubric, and the survey results are analyzed to determine the effectiveness of the instructional materials.

Research Results

Analysis

Needs Analysis

Teachers at specialized high schools who guide students in writing resumes and preparing for interviews believe that Generative AI can serve as a helpful tool in supporting students’ job-seeking preparation. Consequently, students unfamiliar with Generative AI would require prior learning, which aligns with the emphasis in the 2022 Revised National Curriculum on incorporating AI education within subject instruction.

Reflecting the findings from prior studies (Choi, 2023; Lee, 2023) and policy directions (Ministry of Education, 2022a, 2022c, 2023b), it becomes clear that educational programs to foster Generative AI literacy must be implemented in schools. There is a verified demand for developing lessons based on Generative AI specifically for vocational high school subjects.

Additionally, as mentioned in Chapter II (Theoretical Background), the achievement standards for the “Exploration and Design of Career and Job” learning element in the “Successful Career Life” subject emphasize the use of digital resources. Therefore, this study selected “Successful Career Life” as the target subject and defined the instructional goal as:

“Using Generative AI tools presented by the instructor, learners explore and design their own career paths, then create and present a presentation.”

Learner Analysis

To analyze learners, a class was conducted with a second-year class at J Specialized High School in Jeonbuk province on December 26–27, 2023. The class content focused on the “Exploration and Design of Career and Job” learning element from “Successful Career Life” subject of the 2022 Revised Curriculum. The digital tools used as instructional media to meet the achievement standards included Padlet¹, ChatGPT, and Canva². The observation results during class are summarized in Table 2.

1 Application for sharing learning outcomes

2 A design platform used for creating visual content like presentations and posters

Table 2. Class observation results for learner analysis

Positive Effects of Generative AI	Improvement in AI Use
Higher-quality writing compared to writing alone within a limited time	Difficulty in composing effective prompts; wasted time on unproductive queries
Easier creation of presentations compared to traditional methods	Lack of familiarity with Generative AI; performance varies significantly by learner level

For this learner analysis, a survey on awareness and utilization experience of Generative AI was also conducted using Google Forms with 140 students from specialized high schools across seven regions: Gangwon, Gyeonggi, Daejeon, Jeonnam, Jeonbuk, Jeju, and Chungbuk provinces. The survey assessed students' awareness of and experience with Generative AI.

Key findings:

- 103 students (73.5%) stated they did not know or barely knew what Generative AI is.
- 107 students (76.4%) had little or no interest in using Generative AI.
- 123 students (87.8%) had rarely or never used Generative AI.
- 76 students (54.2%) expressed little or no willingness to participate in classes using Generative AI.

Obtained from these students, open-ended responses for “Preferred class formats using Generative AI” included:

- Understanding of Generative AI
- Hands-on practice-based lessons
- Programming practice using Generative AI
- Presentation creation practice using Generative AI
- Practice for image generation and resume writing using Generative AI

The analysis concluded that lessons using Generative AI should include foundational knowledge such as its definition and characteristics. Additionally, to address performance gaps caused by differences in students' digital literacy, tailored support is needed. Motivational elements must also be incorporated, especially since many students show low initial interest in Generative AI. Finally, student-centered, hands-on activities are more effective than lecture-based formats.

Environmental Analysis

According to the 2023 Educational Statistics Yearbook by the Ministry of Education and the Korean Educational Development Institute (KEDI), the number of students in vocational high schools in 2023 was 172,852. The number of smart devices available at schools was 212,237, including the following types in Table 3. The change in the number of students per computer by year is shown in Fig. 2.

Table 3. Number of computers in vocational high schools (2023)

Desktop	Laptop	Tablet
122,338	20,425	69,474

The number of students per computer is 1.6 as of 2023, which is an environment suitable for operating classes using Generative AI. At the J Specialized and Meister High Schools in Jeonbuk province—where this study's pilot and main classes were conducted—each classroom was equipped with 18–26 student computers and 1 teacher computer connected to the internet. Thus, both the hardware and network environments were deemed suitable for implementing

Generative AI lessons.

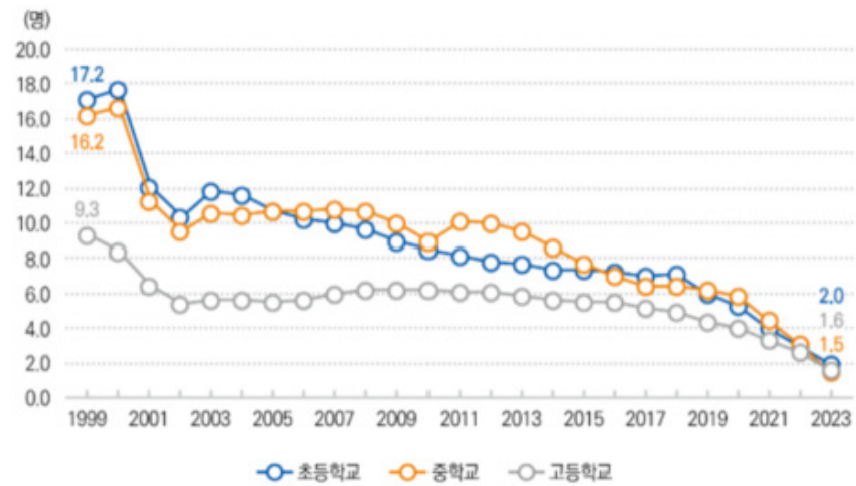


Fig. 2. Number of students per computer (1999–2023)
(Source: KEDI, 2023 Educational Statistics Indicators, reorganized)

Task Analysis

Task analysis is a core activity for structuring instructional content and organizing procedures. It involves goal analysis and subordinate skills analysis (Ewha Womans University Department of Educational Technology, 2023). According to Gagné’s learning taxonomy (1985), learning domains can be classified into five categories:

- Verbal Information
- Intellectual Skills
- Cognitive Strategies
- Psychomotor Skills
- Attitudes

Instructional goals are stated and the learning areas are classified by referring to the results of needs analysis, learner analysis, and environment analysis, as shown in Table 4.

Table 4. Classification of learning areas for instructional goals

Instructional Goal	Learning Area				
	Verbal Information	Intellectual Skills	Cognitive Strategies	Psychomotor Skills	Attitudes
A Students can explore their own career and job path using Generative AI.	○	○	-	-	○
B Students can design their own career and job path using Generative AI.	-	○	-	-	-
C Students can use Generative AI tools to produce and present a presentation based on their career exploration and design.	○	○	-	-	-

To successfully achieve each instructional goal, learners must master the prerequisite subordinate skills associated with each. The analysis method varies depending on the learning area and includes hierarchical analysis, procedural analysis, clustering analysis, and integrative analysis (Ewha Womans University, Department of Educational Technology, 2023).

According to Dick et al. (2014), it is essential to avoid unnecessary functions that may hinder the acquisition of required skills. In this study, integrative analysis was used for Goals A and C, while procedural analysis was applied for Goal B (Ju, 2025, p. 49). The results are presented in Table 5.

Table 5. Subordinate skills for each instructional goal

Instructional Goal	Subordinate Skill	
A	A-1	Understand Generative AI
	A-2	Explore career and job paths using Generative AI
	A-3	Synthesize and organize the results of career/job exploration using Generative AI
B	B-1	Design a career and job path using Generative AI
	B-2	Synthesize and organize the career/job design results using Generative AI
C	C-1	Understand design platforms
	C-2	Create a presentation based on ‘Exploration and Design of Career and Job’
	C-3	Present the results of their career/job exploration and design

Table 6. Restated learning objectives by instructional goal and subordinate skill

Instructional Goal	Subordinate Skill	Restated Learning Objective
A	A-1	Understand Generative AI and formulate effective prompts to obtain desired answers.
	A-2	Explore one’s own career and job path using Generative AI.
	A-3	Synthesize the exploration results and organize them using a provided template.
B	B-1	Design one’s career and job path using Generative AI.
	B-2	Synthesize the design results and organize them using a provided template.
C	C-1	Understand design platforms and utilize Generative AI functions.
	C-2	Create a presentation on the explored and designed career path using a design platform.
	C-3	Present the results of one’s career and job exploration and design using the created presentation materials.

Design

Statement of Learning Objectives

Based on the subordinate skills derived from the task analysis, eight learning objectives were restated as shown in Table 6.

Establishment of Evaluation Methods and Strategies

Although the teaching-learning materials developed in this study utilize Generative AI as a learning tool, learner analysis revealed that most students had low interest or engagement with Generative AI. Therefore, motivational elements needed to be embedded within the learning process. Based on the findings of Black et al. (1998) showing that formative assessments positively impact academic performance, this study incorporated formative assessment activities during the lessons to support learner achievement. Drawing from research on formative evaluation methods (Kim, 2013; Kim et al., 2015), this study designed the evaluation methods and strategies as outlined in Table 7.

Table 7. Evaluation methods and strategies

Evaluation Method	Strategy
Multiple-choice quiz	Use Google Forms for individual students to self-assess foundational knowledge (e.g., understanding Generative AI) and review gaps.
Observation	During hands-on activities, teachers observe and provide immediate feedback.
One-minute speech	Students explain their learning process to a peer for 1 minute, exchange feedback, and the teacher provides feedback as needed.
Rubric-based self-assessment	Learners use a rubric to assess their own performance, identify shortcomings, and make improvements.

Selection and Sequencing of Learning Content, Instructional Strategies and Methods, Media Design

Learning objectives were refined into specific content elements and sequenced as shown in Table 8. To align with these contents, appropriate instructional strategies and media were selected.

Given the low level of understanding and interest in Generative AI among most learners, learner motivation is a critical factor in achieving the instructional goals. Thus, the ARCS model by Keller (2010) was applied to design motivational strategies. The ARCS model consists of four major learning elements influencing human motivation:

- Attention (A)
- Relevance (R)
- Confidence (C)
- Satisfaction (S)

Each component has three subcategories and associated strategies, as shown in Table 9.

Table 8. Learning content selection and sequencing

Learning Objective	Learning Content
A-1	· Concept, types, and current status of Generative AI · Positive and negative aspects of Generative AI · Impact of Generative AI and responsible use
A-2	· Formulating prompts and reviewing responses from Generative AI · Identifying personal interests and aptitudes · Exploring and selecting career paths that align with interests and aptitudes · Exploring and selecting suitable jobs
A-3	· Synthesizing exploration results and completing them in a provided template
B-1	· Setting long-term goals to achieve the selected career · Creating action plans for long-term goals
B-2	· Synthesizing design results and completing them in a provided template
C-1	· Concept, types, and current status of design platforms · How to use design platforms
C-2	· Creating a presentation using Generative AI based on the synthesized results
C-3	· Presenting the created presentation and receiving feedback

Table 9. ARCS motivational design and classroom application

Component	Subcategory & Strategy	Application in Class
Attention (A)	Perceptual Arousal	Present motivational videos
	Inquiry Arousal	Provide personalized learning time
	Variability	Use various media and tasks
Relevance (R)	Familiarity	Show relatable examples of AI from SNS
	Goal Orientation	Provide tiered assignments
	Motive Matching	Highlight the connection to students' real career exploration
Confidence (C)	Learning Requirements	Provide tutorials and how-to videos
	Success Opportunities	Offer praise for small achievements
	Personal Control	Share peer success stories
Satisfaction (S)	Natural Consequences	Emphasize the benefits of AI experience
	Positive Outcomes	Reward high-quality student work
	Fairness	Share assessment criteria in advance

The teaching-learning methods are as follows. In order to promote active participation of learners based on the results of prior research confirmed in the needs analysis phase, hands-on classes where learners can experience is operated and lecture-style classes to understand basic knowledge and utilization methods of generative AI and design platforms are also conducted.

A medium suitable for learning and that instructors can easily share learning content with learners or use in class as a teaching-learning medium is selected. In the “Exploration and Design of Career and Job” courses, text-type generative AI is used so that learners can obtain the answers they need in text form. Among the text-type generative AIs that can be used for free, such as ChatGPT and Wrtn, ChatGPT was selected in this study. The reason is that learners’ conversations can be easily shared with the ‘Share’ button. As mentioned by Seo (2023), it is easy to apply the already developed prompt engineering technique.

In the ‘Presentation Creation’ course, two design platforms were used to easily create a presentation from the ‘Career Design’ created by learners. First, Gamma was used, which specializes in presentation creation and allows one to create presentations for free and download files multiple times. Next, Canva was used, which allows one to use most of the paid features for free if one authenticates one’s educational account, and which not only allows one to utilize the Generative AI feature, but also allows one to easily edit presentations and allows learners to control slides with their personal mobile devices when giving presentations. The purpose and characteristics of the selected teaching media are as shown in Table 10.

Table 10. Purposes of teaching-learning tools and their characteristics

Tool	Purpose of Use	Characteristics
ChatGPT	• Exploration of career and occupations • Design of career and occupations	• Google ID login available • Easy content sharing via “Share” Button • Suitable for learning basic prompt engineering techniques
Gamma	Creation of presentation materials	• Google ID login available • Learners can create presentation materials based on their own ‘Career Design Sheets’ in PDF format • At least 10 presentations can be created with a free account • Presentations can be downloaded and uploaded to other platforms
Canva	Editing and presenting presentation materials	• Google ID login available • Education account verification allows use of premium templates • Teachers can assign tasks and students can submit them • AI-based presentation creation support available • Students can present slides via their mobile devices

Development

Development of Lesson Plans, Rubrics, and Teaching-Learning Materials & Expert Validation

To facilitate the use of Generative AI in the class for the “Exploration and Design of Career and Job” learning element, a total of six class sessions were developed. Based on the achievement standards of the 2022 Revised Curriculum for the “Successful Career Life” subject, a scoring rubric was composed (Ju, 2025, pp. 126–127), as shown in Table 11. Using the developed lesson plan and rubric, supplementary materials such as presentation materials, videos, and example materials were created (Ju, 2025, pp. 111–138).

Table 11. Scoring rubric

Task	Scoring Criteria	Score
Exploration	Completion of items 1–5	5
	Completion of items 1–4	4
	Completion of items 1–3	3
	Completion of items 1–2	2
	Completion of item 1 only	1
	1. Using ChatGPT, explore personal interests, aptitudes, and personality.	
	2. Using ChatGPT, explore related career paths and occupations.	
	3. Using ChatGPT, select desired career/occupation and research successful professionals.	
	4. Using ChatGPT, analyze the success factors of professionals.	
	5. Using ChatGPT, summarize and organize findings into the “Career and Job Exploration” section of the Career Design Plan.	
Design	Completion of items 1–5	5
	Completion of items 1–4	4
	Completion of items 1–3	3
	Completion of items 1–2	2
	Completion of item 1 only	1
	1. Using ChatGPT, set long-term goals for one’s own future career.	
	2. Using ChatGPT, develop a plan to achieve the long-term goals.	
	3. Using ChatGPT, set short-term goals appropriate to one’s own future career.	
	4. Using ChatGPT, develop a plan for short-term goals.	
	5. Using ChatGPT, complete the “Career and Job Design” section of the Career Design Plan.	
Material & Presentation	Completion of items 1–5	5
	Completion of items 1–4	4
	Completion of items 1–3	3
	Completion of items 1–2	2
	Completion of item 1 only	1
	1. Using Gamma, convert the Career Design Plan into a presentation.	
	2. Using the detailed functions of Canva, modify the presentation.	
	3. Using Canva’s Magic Media, create a future image of oneself.	
	4. Using Canva, submit the final presentation on the homework folder.	
	5. Using the presentation created with Canva, present the results of one’s career exploration and design.	

Expert validation was conducted with a group consisting of one university professor specializing in vocational and technical education and four high school teachers with experience teaching career-related content using Generative AI. Their profiles are shown in Table 12. The results of the expert validation on the field applicability of the teaching-learning materials are shown in Table 13. The highest-rated items (4.8/5) were questions 1, 2, 6, 7, and 8, while the lowest-rated item (4.0/5) was question 10. Expert feedback and the corresponding revisions are shown in Table 14.

Table 12. Experts for validating field applicability

Name	Major	Teaching Experience	Position/Degree	Experience of Teaching Generative AI
Lee ○○	Industrial Edu., Career Edu.	15+ years	Professor / Ph.D.	×
Lee ○○	Mechanical & Metal Eng.	10+ years	Teacher / M.A.	○
Oh ○○	Mechanical & Metal Eng.	5+ years	Teacher / M.A. (in progress)	○
Song ○○	Mechanical & Metal Eng.	5+ years	Teacher / M.A. (in progress)	○
Han ○○	Mechanical Eng.	5+ years	Teacher / M.A. (in progress)	○

Table 13. Expert validation on teaching-learning material applicability

Item	Mean	Standard Deviation
Is the lesson appropriate for high school level?	4.8	0.44
Is the time distribution appropriate?	4.8	0.44
Is the use of ChatGPT suitable for career exploration/design?	4.6	0.89
Is the use of Canva appropriate for sharing and presentation?	4.4	0.89
Do learning goals align with achievement standards?	4.8	0.44
Is the content appropriate for achieving the learning goals?	4.8	0.44
Is the structure and sequence of the class appropriate?	4.8	0.44
Are the materials suitable for learners' understanding?	4.6	0.54
Is the class designed to engage students' interest?	4.6	0.89
Are the formative and self-assessments appropriate for confirming learning goal achievement?	4.0	1.00
Is the rubric appropriate for assessing achievement levels?	4.4	0.89

Table 14. Expert feedback and revisions

Expert Feedback	Reflection
The formative assessment only evaluates cognitive aspects; it seems inadequate to assess goal achievement.	Add a student presentation and feedback session using AI-generated dialogues.
It is required that rubric items follow a hierarchical structure and revise format.	Revise rubric format to reflect hierarchy.
The example presentation created with Canva lacked quality, potentially failing to motivate students.	Replace with a higher-quality presentation example.

Pilot Test: Issue Identification and Revisions

Following expert validation, a pilot test was conducted with eight third-year students at J Meister High School in Jeonbuk province. All students completed the Career Design Plan using ChatGPT for exploration and design. However, several students reported difficulty creating presentations using Canva. Many failed to complete their presentations within the allotted time, and the quality of the final products was low.

As a result, the Gamma platform was newly introduced to simplify presentation creation. Semi-structured tasks were provided in the form of suggested titles and outlines. Instructors conducted systematic demonstrations, which were included in the revised lesson plan. Feedback from the pilot test and corresponding revisions are shown in Table 15. The composition of the final teaching-learning materials, revised and supplemented to improve the presentation creation process based on the results of the pilot test, is shown in <Table 16>. The relevant contents can be viewed by follow links in Table 16.

Table 15. Pilot test results and reflections

Result	Reflection
Difficulty in presentation creation	• Gamma platform additionally utilized for beginners in presentation creation • Teachers provide presentation titles and outlines to guide students' tasks in a structured format • The steps for creating presentations were structured and presented as part of the learning process

Table 16. Finalized teaching-learning materials

No.	Materials	Contents
1	Lesson Plan	https://gqr.sh/HKW8
2	Lecture Slides	https://gqr.sh/DR9T
3	Evaluation Materials	https://gqr.sh/QQhc / https://gqr.sh/G6sr
4	Techniques & Examples	https://gqr.sh/eLxX / https://gqr.sh/3s62 / https://gqr.sh/BHNA / https://gqr.sh/uWF5
5	Learning Artifacts	https://gqr.sh/HXP8 / https://gqr.sh/qeZQ / https://gqr.sh/HXHs / https://gqr.sh/Zvb2
6	Videos	Refer to lecture slides link

Implementation

For the main field test, a class was conducted on November 12, 2024, with 16 third-year students from J Meister High School in Jeonbuk province, as shown in Fig. 3. However, due to three students being excused, only 13 students completed all six sessions. The result submitted by student A is presented in Fig. 4. A learner satisfaction survey was administered to the 13 students who completed all sessions.



Fig. 3.The class at j meister high school

[illegible]

Fig. 4.Results from A student

Evaluation

Analysis of Achievement Level of “Exploration and Design of Career and Job” Standards

To verify the appropriateness of applying the developed teaching-learning materials to actual subject instruction, this study evaluated student achievement standard compliance of the “Exploration and Design of Career and Job” using the previously developed rubric (see Table 11).

As evaluation artifacts, the “Career and Job Design Plans” and presentations submitted by the 13 students who participated in all class sessions were collected. These were assessed across three categories:

- Career and job exploration
- Career and job design
- Creating and presenting presentation

Among the 13 students, Student B scored 0 points in the "career and job design" area due to submitting irrelevant content. Only five students (A, E, H, I, K) completed their presentations within the given time, scoring the maximum 5 points in the "Creating and presenting presentation" category. The average score among all students was 14 out of a possible 15 points, indicating a high level of achievement. The detailed results are shown in Table 17.

Table 17. Evaluation results based on the rubric (0–5 points per category)

Student	Career and Job Exploration	Career and Job Design	Creating and presenting presentation	Total
A	5	5	5	15
B	5	0	4	9
C	5	5	4	14
D	5	5	4	14
E	5	5	5	15
F	5	5	4	14
G	5	5	4	14
H	5	5	5	15
I	5	5	5	15
J	5	5	4	14
K	5	5	5	15
L	5	5	4	14
M	5	5	4	14
Average	—	—	—	14

Collection and Analysis of Learner Satisfaction Survey Results

A satisfaction survey was conducted with the 13 third-year vocational high school students who completed all sessions of the class. The survey included five multiple-choice questions with three answer options each and open-ended questions. Survey In the multiple-choice section is in Table 18. Next, in the open-ended questions, the results of asking about what was good or impressive in the class were as follows: Experience with generative AI, experience creating presentation materials with generative AI, etc. As for the difficulty, the question format for ChatGPT was mentioned.

Table 18. Learner satisfaction survey – multiple choice results

Question Topic	Response (Number of Students)
Class time adequacy	Too short (1), Appropriate (11), Too long (1)
Usefulness of Generative AI in “Exploration and Design of Career and Job”	Not helpful (0), Neutral (1), Helpful (12)
Increase in interest in Generative AI	No (0), Neutral (4), Yes (9)
Helpfulness in learning how to use Generative AI	No (0), Neutral (1), Yes (12)
Willingness to participate in other classes using Generative AI	No (1), Neutral (4), Yes (8)

Discussions

This study aimed to develop and apply teaching-learning materials utilizing Generative AI for vocational high school students. A total of seven sessions of teaching-learning materials were developed, tailored to the 'Exploration and Design of Career and Job' learning element within the 'Successful Career Life' subject, a specialized common subject in the 2022 Revised National Curriculum for vocational high schools. The developed materials were applied in actual classes, and the evaluation of student outcomes using a rubric showed an average score of 14 out of 15 points, confirming a high level of achievement. Based on these research results, the discussion points of this study are as follows.

First, this study is significant because it developed teaching-learning materials by applying Generative AI to a specialized common subject at vocational high schools. Existing research related to Generative AI education has largely been limited to general subjects (Lee & Song, 2023; Jang & So, 2023]. While the necessity and demand in the vocational education field can be confirmed through social atmosphere and prior studies (Cho & Kim, 2023), teachers at vocational high schools feel burdened by a complete overhaul of teaching-learning and instructional methods (Lee et al., 2023). The specific lesson plans and teaching-learning materials developed in this study, considering both the characteristics of vocational high school students and the achievement standards presented in the 2022 Revised National Curriculum, will provide practical assistance to teachers in actual educational settings in improving existing instructional methods through Generative AI-utilized classes, and can be seen as expanding the horizons of Generative AI application research in vocational education. However, if teaching-learning materials developed for application in educational settings, like those in this study, are not widely disseminated and used, the research may remain a one-time effort. Information sharing, such as teaching-learning materials in vocational education, is less active compared to general subjects, and measures need to be established to overcome this situation.

Second, this study empirically demonstrated that Generative AI can go beyond being a simple information search tool, assisting students in career exploration and design, and even supporting creative expression and presentation material creation. This supports prior studies indicating that Generative AI is helpful for writing (Cho & Kim, 2023; Kwon, 2023). However, the most significant issue when using Generative AI is 'hallucination,' where false information is convincingly presented, making it crucial to verify the accuracy of the generated information. Students can more easily discern the authenticity of information when writing their own personal stories (Ahn, 2024). Therefore, the 'Exploration and Design of Career and Job' learning element selected in this study, which involves exploring and designing one's own career, can be an effective application method in educational settings utilizing Generative AI. Furthermore, it can be a way to improve the low awareness and interest levels of vocational high school students regarding Generative

AI, as revealed by Kim and Cho (2023). This aligns with the research by Do and Kim (2023) which showed that career education linked to student employment and hands-on classes can enhance educational effectiveness. Additionally, the classes utilizing the teaching-learning materials developed in this study focused not merely on how to use Generative AI, but on teaching prompt writing methods for conversing with Generative AI, which aligns with the future direction of Generative AI education as stated by Choi (2024). However, education utilizing Generative AI is significantly influenced by students' existing digital resource utilization abilities. Since Generative AI can be accessed through various digital resources such as PCs and smartphones, students who are accustomed to skillfully using smart devices for their own purposes can use Generative AI more proficiently (Lee & Lee, 2024). Considering this, 'digital divide' will always be an unavoidable problem in classes applying Generative AI. Moving forward, it is necessary to be mindful of preventing a 'digital divide' before integrating Generative AI into educational settings, and education on effectively utilizing digital resources should precede Generative AI education.

Conclusion and Suggestions

Conclusion

The purpose of this study is to develop teaching-learning materials that utilize Generative AI in the 'Exploration and Design of Career and Job' class of the 'Successful Career Life' subject at vocational high schools, and to introduce it to specialized subjects. In this study, the "Successful Career Life" subject was selected because it is a core subject in vocational high schools and the only specialized common subject reflected in the College Scholastic Ability Test as of 2028. In order to achieve the purpose of the study, the ADDIE model was partially modified and applied to the study. The conclusions are as follows.

First, the needs analysis revealed that research on the use of Generative AI in specialized subjects at vocational high schools is necessary through social trends and teachers' perceptions, but the learner analysis confirmed that interest and concern about Generative AI were low. Accordingly, it is necessary to develop and introduce new teaching-learning materials so that learners' interest and concern about Generative AI can be increased in specialized subjects and classes that utilize Generative AI can be operated.

Second, the learning objectives were derived through task analysis, and an evaluation plan using rubrics was established. Instructional strategies were designed using the ARCS model to motivate learners. ChatGPT, Gamma, and Canva were selected as generative AI tools and integrated into the instructional process.

Third, a lesson plan and accompanying materials, including evaluation tools and media, were developed. Field applicability was verified through expert validation and pilot testing, leading to revisions and finalization of materials for seven sessions. These finalized materials were provided through a URL to ensure easy access and practical use by other educators.

Forth, the teaching-learning materials of 'Exploration and Design of Career and Job' developed in this study were applied to schools and the results of 13 learners were graded. The average score was 14 out of 15, which was a good result. Therefore, the 'Exploration and Design of Career and Job' class using ChatGPT, Gamma, and Canva selected in

this study can be considered helpful in achieving the achievement standards of ‘Exploration and Design of Career and Job’ in the ‘Successful Career Life’ subject presented in the revised 2022 curriculum.

This study is expected to be an opportunity to enrich the quality and outcomes of classes by introducing generative AI into vocational high school classes and utilizing it in classes, along with the experience of using it for students.

Suggestions

Based on the conclusions of this study, the following suggestions are presented:

First, there is a need for educational research that can utilize Generative AI in various subjects operated by vocational high schools through follow-up research.

Second, the classes applied in this study were applied to 13 third-year students of vocational high schools. In follow-up research, it is necessary to expand the scope of the research by expanding the school level, school type, and grade level.

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